Constraining uncertainties in the permafrost-climate feedback (COUP)

Leading Principal Investigator: Dr. Gustaf Hugelius, Stockholm University, Sweden

Principal Investigators:

Prof. Peter Kuhry, Stockholm University, Sweden

Dr. Tarmo Virtanen, University of Helsinki, Finland

Assistant professor Christina Biasi, University of Eastern Finland

Senior researcher Dr. Narasinha Shurpali, University of Eastern Finland

Prof. Pertti Martikainen, University of Eastern Finland

Dr. Christian Juncher Jørgensen, University of Copenhagen, Denmark

Prof. Bo Elberling, University of Copenhagen, Denmark

Dr. Sebastian Westermann, University of Oslo, Norway

Professor Bernd Etzelmüller, University of Oslo, Norway

Senior Scientist Dr. Eleanor Bruke, Met Office Hadley Centre, UK

Prof. Colin Jones, University of Leeds, UK

Dr. Trofim Maximov, Institute for Biological Problems of Cryolithozone SB RAS, Russia

Dr. Dmitry Kaverin, Institute of Biology Komi SC RAS, Russia

Dr. Georg Guggenberger, Leibniz Universität Hannover, Germany; and VN Sukachev Institute of Forest, Krasnoyarsk, Russia

External partners:

Prof. Andreas RICHTER, University of Vienna and Austrian Polar research Institute, Austria

Senior Scientist Dr. Lutz Schirrmeister, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany

Dr. Moritz Langer, Alfred-Wegener-Institute Potsdam, Germany

Dr. Jorien E. Vonk, Utrecht University, The Netherlands

Prof. Edward A.G. Schuur, Department of Biology, University of Florida, USA

Dr. Julie Jastrow, Argonne National Laboratory, USA

Dr. Charles Koven, Lawrence Berkeley National Laboratory, USA

Project Summary:

As the global climate warms, thawing permafrost may lead to increased greenhouse gas release from Arctic and Boreal ecosystems. Scientists agree that this permafrost-climate feedback is important to the global climate system, but its magnitude and timing remains poorly understood. The overall aim of COUP is to use detailed understanding of landscape-

scale processes to improve global scale climate models. Better predictions of how permafrost areas will respond to a warming climate can help us understand and plan for future global change. In recent years much scientific progress has been made towards understanding the complex responses of permafrost ecosystem to climate warming. Despite this, large challenges remain when it comes to including these processes in global climate models. Permafrost ecosystems are highly variable and studies show that very detailed field investigations are needed to understand complexities. Because global scale models cannot run at such high-resolutions, we propose an approach where local landscape-scale field studies and modelling are used to identify those key variables that should be improved in global models. We will carry out careful field studies and high-resolution modelling at field sites covering all pan-Eurasian environmental conditions. The system understanding gained from this will then be used to (1) scale key variables so they are useful for global models and (2) improve a new global climate model. In the final step, the improved global climate models will be run to quantify the impact of thawing permafrost on the global climate. Datasets produced in COUP will be freely available online so that they can be used by other scientists and help improvement of all global climate models. COUP is designed to maximize synergies with ongoing projects. Much of the needed data and system understanding was generated in other research programmes.